A Preliminary Summary Of The August 22, 2012 Las Vegas Valley Heavy Rain And Flash Flood Event

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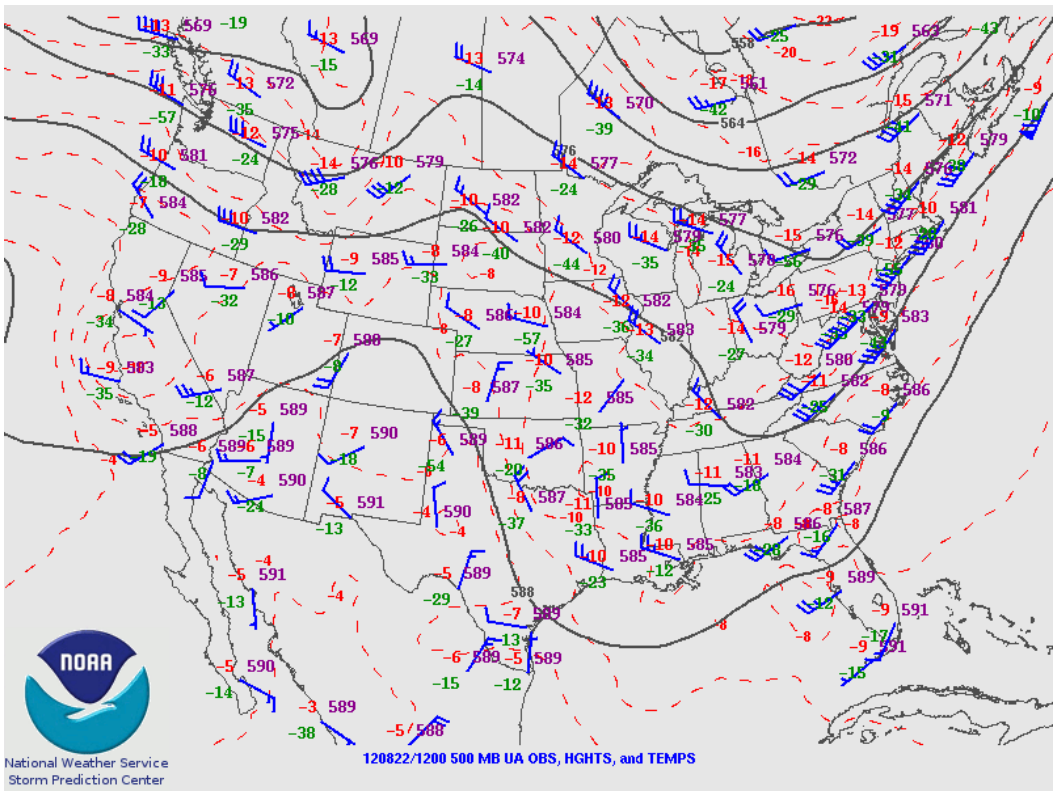
During the late morning hours of August 22, 2012 exceptionally heavy rain fell from thunderstorms over the southern half of the Las Vegas Valley, especially from McCarran International Airport south and east. Widespread rainfall totals of 1 to 2 inches with isolated higher amounts were observed in the southern half of the Las Vegas Valley, with most of this falling in about a 3 hour period. This is roughly 40 percent of the normal annual precipitation for these areas. Significant flash flooding took place as a result in the southern half of the Las Vegas Valley, particularly in Henderson.

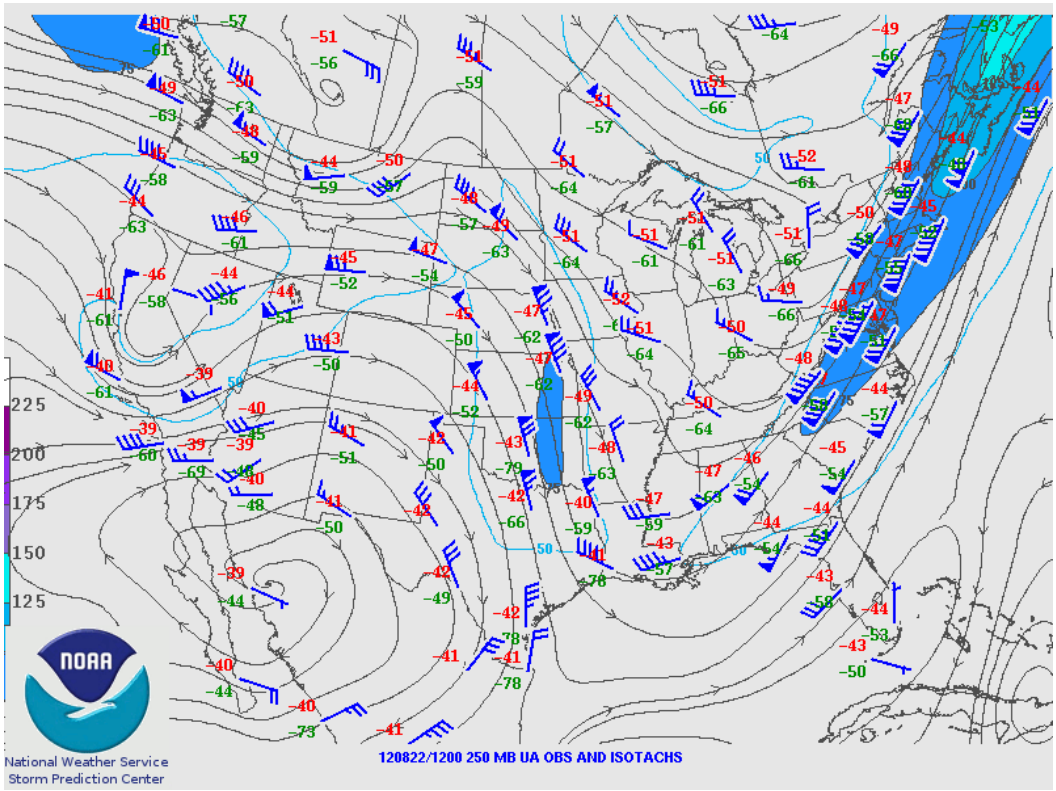
The Set-Up

Upper air analysis from the morning of August 22, 2012 (12Z) showed an area of low pressure across central California in the atmosphere from 850 mb through 250 mb that was moving east. Exceptionally high moisture was in place across southern Nevada with the observed 850 mb dewpoint temperature on the 12Z radiosonde launched from the Las Vegas National Weather Service office at 15 degrees Celsius. Typically as a rule of thumb, any values above 8 degrees Celsius at 850 mb are considered impressive during the monsoon season and a good indicator of thunderstorms having heavy rain potential. In addition, good diffluence aloft can be noted in the mid and upper levels of the atmosphere across southern Nevada along with a 55 knot jet streak at 250 mb, both which helped to support enhanced lifting of air parcels in the atmosphere. The combination of this enhanced lift and an extremely moist atmosphere produced a set-up favorable for thunderstorms producing heavy rain.

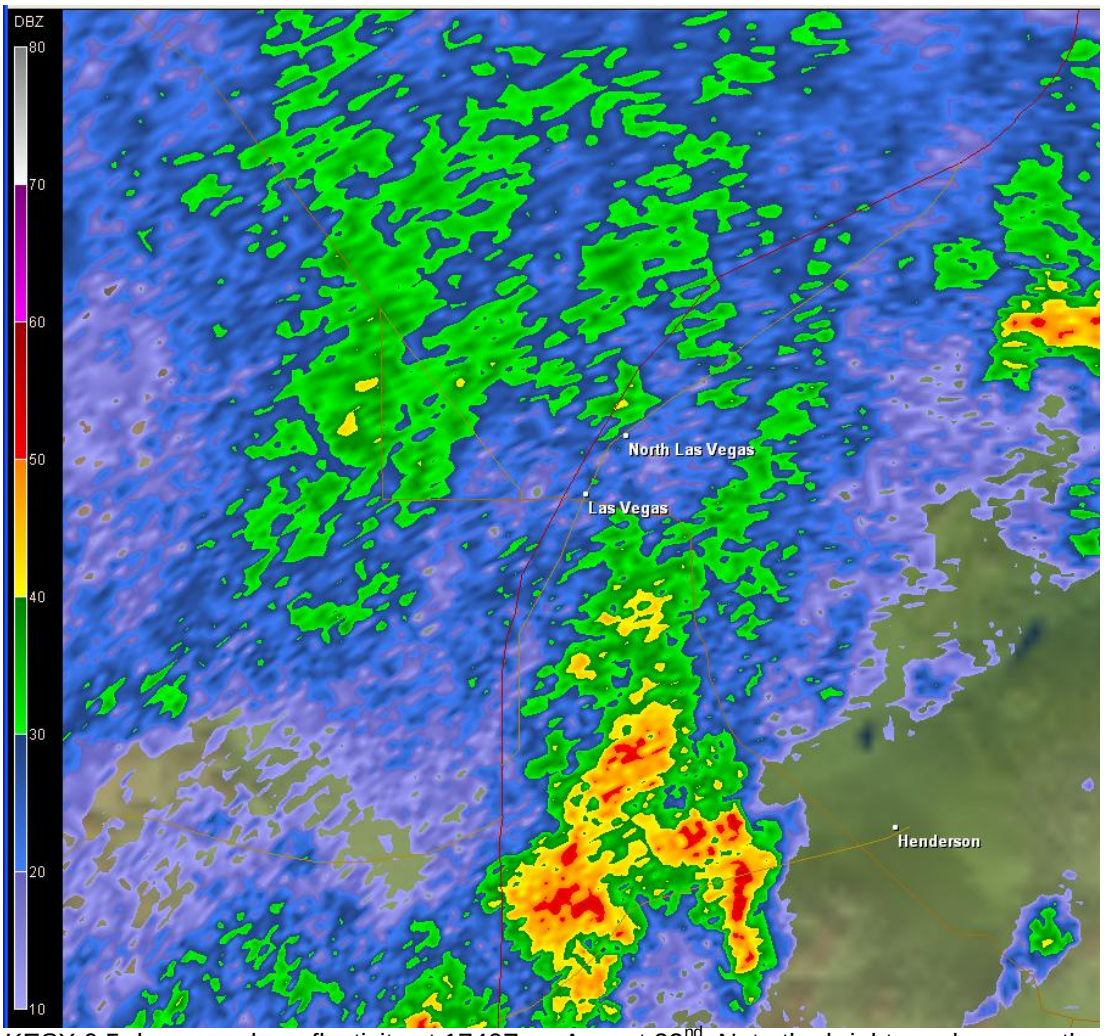
What Happened

Showers and thunderstorms began to move into the Las Vegas Valley around 8 AM PDT on August 22nd and became more numerous around 9 AM PDT. The heaviest activity developed shortly after 10 AM PDT and moved across the southeast portion of the Las Vegas Valley as noted by radar returns and observations from the automated weather stations at McCarran International Airport and the Henderson Executive Airport. The heaviest rain generally ended around12 PM PDT with only light rain falling in most areas after that through around 5 PM PDT.





Upper air charts showing the observed values at 500 mb and 250 mb at 12Z on August 22, 2012. Blue wind barbs can be noted on both maps while solid black lines indicate height lines. Maps courtesy Storm Prediction Center.



KESX 0.5 degree radar reflectivity at 1740Z on August 22nd. Note the brighter colors over the southeast part of the Las Vegas Valley where heavier rain was falling.

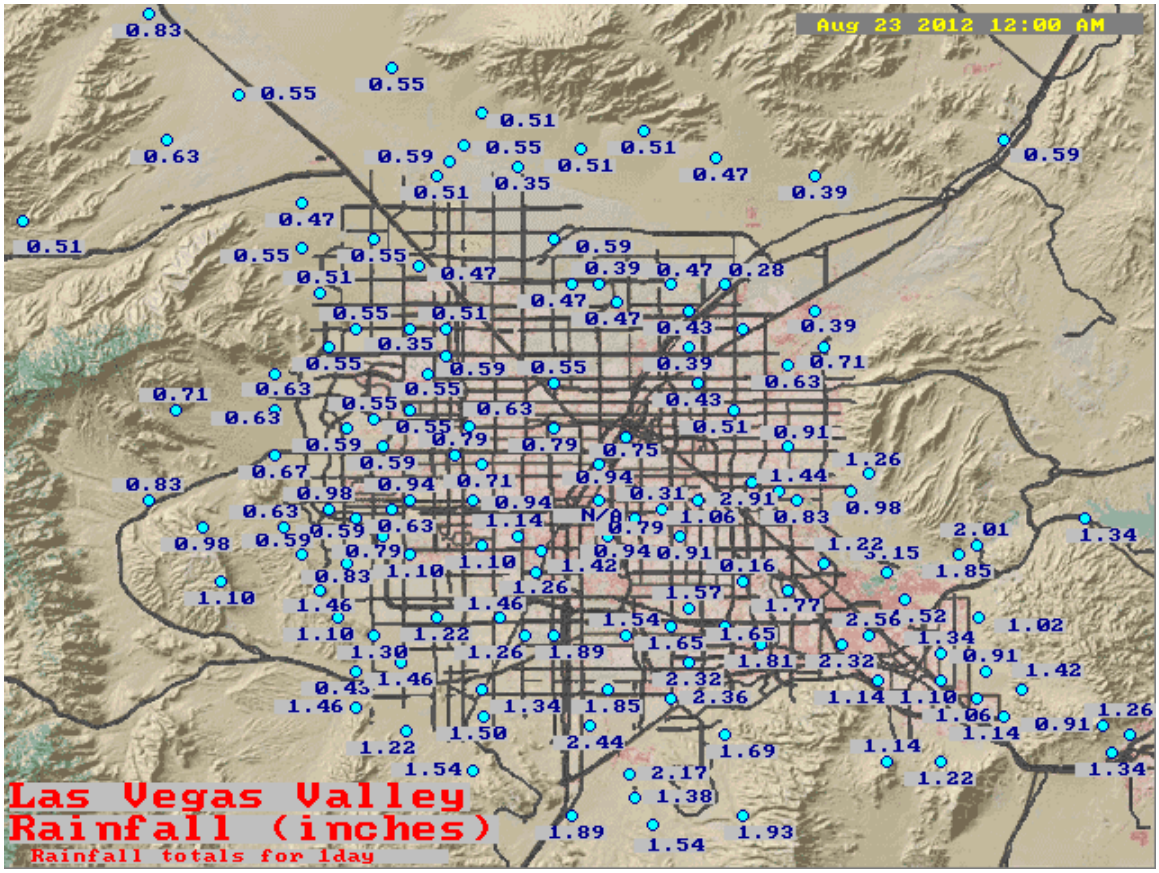
Impacts

Numerous roads throughout the southern half of the Las Vegas Valley were flooded, many with several feet of water along with vast quantities of mud and large rocks. The first report of flash flooding in the Las Vegas Valley was at 1045 AM PDT in the Spring Valley neighborhood. More significant flooding took place in Henderson just after 1100 AM PDT, with a number of roads being closed. Even portions of Las Vegas Boulevard were flooded including on The Strip. Many vehicles became immersed in floodwaters, including a number that were parked in low lying areas. At least 6 swiftwater rescues were conducted in the Las Vegas Valley by first responders. A church suffered over $500,000 in damages after 3 feet of floodwaters entered it. Washes swelled with rapidly flowing water. A 17 year old boy was found dead after he fell into a wash near Stephanie and Sunset in Henderson and was swept miles downstream toward the Las Vegas Wetlands Park on the east side of the Las Vegas Valley.

Rainfall Totals

The official long term climate station for Las Vegas is located at McCarran International Airport on the southwest side of the airport complex. The total rainfall here was 1.65 inches, most of which fell in a 3 hour period between 9 AM and 12 PM PDT. This was the second highest calendar day total ever measured at the official Las Vegas climate station since records started in 1937. The all-time record remains 2.58 inches set on August 21, 1957. Since records have started, only 25 days in Las Vegas have ever recorded an inch or more of rain.

Automated weather stations operated by the Clark County Regional Flood Control District as well as Mesonet weather stations, cooperative observers and spotter reports showed the heaviest rain of 1 to 2 inches fell generally along and south of Tropicana Avenue with the heaviest totals in the southeast portion of the Las Vegas Valley where some locations did exceed 2 inches. The highest verifiable storm total was 3.15 inches at the Clark County Regional Flood Control District's weather station at the Las Vegas Wash at the Pabco Road grade control structure. Rainfall amounts decreased significantly further north in the Las Vegas Valley with a general one third to two-thirds of an inch measured north of Highway 95.



Las Vegas Valley rainfall totals from August 22, 2012 from automated weather stations operated by the Clark County Regional Flood Control District.

How Often Does Rain This Heavy Occur Historically?

Although a storm total of 1.65 inches of rain fell at McCarran International Airport during this event, the heaviest rain generally fell in a 3 hour period. The highest 3 hour total measured was 1.46 inches. Using point precipitation estimates calculated specifically for McCarran International Airport and the 3 hour precipitation total, this was roughly a 30 year rainfall event for the McCarran Airport weather station.

How Does This Flood Compare To The July 8, 1999 Flash Flood?

The flash flood of July 8, 1999 remains the most significant flash flood event in modern Las Vegas history. Total damages in 1999 dollars were $25 million. Although McCarran Airport did see more rain with this event than on July 8, 1999 (a storm total of 1.29 inches fell then), the rainfall with this event was not nearly as intense in as short of a period. During the July 8, 1999 flash flood a total of 1.05 inches fell in one hour at McCarran International Airport, while the highest one hour total in this event was 0.83 inch. This likely did help to mitigate some of the flooding.

Another factor that likely helped mitigate flooding in this event was that rainfall totals over the west-central and central portions of the Las Vegas Valley were significantly lower. During the July 8, 1999 event 1 to 3 inches of rain fell in these areas while in this event totals were between a half an inch and an inch in areas such as Summerlin. This resulted in much less water running into the headwaters of washes that run across the Las Vegas Valley such as the Flamingo. During the July 8, 1999 flash flood, the heavy rain across the west side of the valley resulted in significant runoff that traveled down across the valley and was compounded by the heavy rain that also fell over areas such as The Strip. This resulted in devastating results by the time the floodwaters reached the east side of the valley near washes.

Lastly, a major reason for less flooding with this event is the overall flood control structure in the Las Vegas Valley has improved greatly since 1999 thanks to the work of the Clark County Regional Flood Control District.

Just How Humid Was It?

One of the most interesting things observed during this event was the duration in which the relative humidity at McCarran International Airport reached 100 percent. It is exceedingly rare to observe 100 percent humidity in Las Vegas, especially for the duration this event did and during the warm season in general. Observations at McCarran showed the relative humidity at 100 percent continuously from 1031 AM until 1111 AM PDT. At the Henderson Executive Airport, 100 percent humidity was reported on all observations from 1020 AM through 110 PM PDT.

Flash flooding in the south portion of the Las Vegas Valley on August 22, 2012 showing vehicles stuck in floodwaters. Photos courtesy: J. Porter.

Aftermath of the flood. Photo courtesy: J. Porter.

Flooding at a bus stop on the south end of Las Vegas Boulevard. Photo Courtesy: R. Peiper.